

TT24-7xr

Specification sheet

The TT24-7xr™ is an advanced thermal desorption (TD) system for continuous low-flow environmental monitoring of volatile and semi-volatile organic vapours in air.



1. System features

- **Dual-trap continuous monitoring** – 100% data capture.
- **Operates cryogen-free** – ideal for unattended remote-site operation over extended periods.
- **Two independent sample channels** – one for each of the two cold traps.
- **Calibration channel** – automated addition of calibration gas during sequence.
- **Blank channel** – automated addition of blank sample during sequence.
- **Leak test** – automated leak checks of all flow paths, including both traps, tube, and split.
- **Internal standard (optional)** – enables addition of gas phase standard onto either cold trap.
- **Kori-xr™ (optional)** – enables on-line removal of airborne humidity.
- **Wide range of sampling flows** with quantitative trapping offers high sensitivity.
- **Inert, uniformly-heated flow path** offers compatibility for C₂–C₄₀ compounds and reactive species.
- **Ultra-rapid trap desorption** delivers narrow peaks, optimising sensitivity even under splitless analytical conditions.
- **Efficient desorption** means no cross-contamination and excellent chromatographic resolution – eliminating false positives.
- **Enhanced splitting options** to accommodate high-level samples.

- **Tube desorption option** facilitates quantitative repeat analysis for easy validation of analyte recovery.
- **Small footprint** – suitable for mobile laboratories.
- **Robust and low maintenance**, including minimal gas consumption.
- **Versatile**: Compatible with any make of GC, fast GC, and various real-time vapour detectors.

2. System controls

2.1 Control software

- **Markes Instrument Control (MIC)** allows:
 - Automated, unattended sequencing of samples.
 - Automated analysis of samples, calibration standard, and blanks.
 - Editing of active sequences.
 - Addition of internal standard to the cold trap prior to sampling.
 - System self-checking.

2.2 Operation modes

- **Continuous on-line sampling** directly onto either cold trap.
- **Leak test** – automated checks of the system without user intervention including re-collection tubes, cold traps, and split flows.
- **Trap heat** for conditioning a cold trap, or confirming there is no sample carryover.

- **Single-tube desorption** onto either cold trap.

2.3 Pre-desorption controls

- **Sample purge time:** This ensures that the standard and blank lines – as well as the entire flow path inside the system – are swept with the current sample before the beginning of their collection. The pre-purge flow is all directed to the split line.
 - Pre-purge time 0–60 min.
 - Settable in 0.1 min increments.

2.4 Sample flow path

- **Sample gas selection:** Three common sample gases can be selected: air, helium, or nitrogen
- **Temperature range:**
 - Valve: 50°C to 210°C.
 - Transfer line: 50°C to 210°C.
 - Both settable in 1°C increments.
- **Constructed entirely of inert materials:** PTFE, quartz, inert-coated stainless steel and uncoated, deactivated fused silica.
- **Patented inert valves** isolate the sampling process from the analytical system, allowing the measurement cycle to extend for as long as the sampling time.
- **Sampling flows:** This determines the flow of sample air/gas into the cold trap for the sampling time. It is controlled by the mass flow controller and is independent of the pressure of the sample.
 - Range: 2–250 mL/min.
 - Settable in 1 mL/min increments.

2.5 Tandem cold traps

- Backflushed quartz cold traps.
- Packed with up to four sorbents.
- **Trap low temperature:**
 - Range: -30 to 50°C.[†]
 - Settable in 1°C increments.
 - Uniform electrical cooling and heating applied over full length of sorbent bed.

[†] Trap low temperatures of -30°C may not be attainable under all operational conditions. Factors affecting the minimum temperature may include flow path temperature, ambient temperature and sampling flow rate.

- **Trap high temperature:**

- Range: 35–425°C.
- Settable in 1°C increments.

- **Trap desorption:**

- Default setting is ballistic heating, which reaches rates in excess of 50°C/s during the first critical stages of secondary (trap) desorption.
- Alternatively, programmed trap heating rates from 1–40°C/s can be selected.

- **Hold time at trap high temperature:**

- Range: 0–99.9 min.
- Settable in 0.1 min increments.

2.6 Tube desorption oven

- **Temperature:**
 - Range: 30–440°C.
 - Settable in 1°C increments.

N.B. The tube oven heats from ambient to the selected temperature at the start of tube desorption in order to minimise risk of flash-vaporisation and split discrimination when analysing samples with unknown water/solvent content.

- **Desorption time:**

- Range: 0–99.9 min.
- Settable in 0.1 min increments.

2.7 Pneumatics

- Requires pressure-controlled 0–60 psig (0–415 kPa) supply of helium or nitrogen carrier gas under manual or electronic control.
- Electronic mass flow control (optional) is settable between 2–500 mL/min (helium), and 2–250 mL/min (nitrogen).
- Requires a pressure-controlled supply of dry (dew point -50°C or below) air or nitrogen in the range 50–60 psig (340–415 kPa). The dry gas is used for both pneumatic actuation of the valve and for purging the cold trap box.

2.8 Sample splitting and quantitative re-collection for repeat analysis

- The TT24-7xr can split a portion of the sample during the following stages:
 - During primary (tube) desorption.
 - During secondary (trap) desorption in either continuous sampling or tube desorption modes of operation.
- The split flow is either controlled by needle valve or electronic mass flow controller depending upon the system configuration. Systems with electronic mass flow control enable different split flows to be selected for each stage of operation (standby, tube desorb and trap desorb). The split flow settings can be stored and recalled as part of the desorption method.
- The split vent line contains a charcoal filter in front of the control valves (and MFC) to prevent contamination of the valves/MFC and laboratory atmosphere. The charcoal filter has the same external dimensions as a standard sorbent tube. The flow path between the main TT24-7xr heated valve and the charcoal filter is a mirror-image of the short, inert, heated flow path connecting the sample tube to the heated valve.
- When required, the charcoal filter can be replaced with a conditioned sorbent tube to quantitatively re-collect the split effluent from tube and trap desorption (inlet and outlet split). This capability allows repeat analysis, method/data validation and archiving of critical samples.

3. System specification

3.1 Dimensions and weight

- Height: 45 cm (17.7").
- Width: 32 cm (12.6").
- Depth: 52 cm (20.5").
- Weight: 25 kg (55 lb).

3.2 Ambient operating conditions

- Temperature: 15°C to 30°C.
- Relative humidity: 5–95% RH (non-condensing).
- Altitude: Up to 2000 m (~6500 ft).

3.3 Power requirements

- 100–240 V, 50/60 Hz, 1200 W (TT24-7xr self-adjusts to local voltage input).

3.4 Gas consumption

- Dry air or nitrogen: ~100 mL/min.
- Carrier gas consumption is method-dependent (typically 5–200 mL/min).

3.5 Safety and regulatory certifications

- The instrument is designed and manufactured under a quality system registered to ISO 9001.
- The instrument complies with the essential requirements of the following applicable European and North American Directives, and carries the CE/UKCA marks
 - Low Voltage Directive 2014/35/EU.
 - EMC Directive 2014/30/EU.
 - ROHS Directive 2015/863/EU
- The instrument conforms to the following product safety standards:
 - IEC 61010-1:2010/AMD1:2016.
 - IEC 61010-2-010/EN 61010-2-010:2014.
 - IEC 61010-2-081/EN 61010-2-081:2015.
 - Canada: CSA C22.2 No.61010-1-12:2012
 - USA: ANSI/UL 61010-1:2012.
- The instrument conforms to the following regulation on electromagnetic compatibility (EMC):
 - IEC/EN 61326-1:2013.

3.6 Data system – Minimum PC specification

- The minimum PC specifications are:
 - 2 GHz Pentium® (or equivalent) processor.
 - 1 GB RAM.
 - 40 MB of free disc space (for TT24-7xr software installation).
 - XGA (1024 × 768 pixel) screen resolution, 256-colour.
 - Windows® 10 or 11 operating system
 - Windows®-compatible mouse and keyboard.
 - One free USB port for communication with TT24-7xr.

3.7 GC remote cable connections

- TT24-7xr includes a GC interface cable which can be used to connect to the ready output and start input of your GC(-MS).
- The cable supports automatic start of the entire analytical system when either of the TT24-7xr cold traps desorbs and also allows the TT24-7xr to check the ready status of the analyser.
- The TT24-7xr cold traps will not be desorbed unless and until it receives a 'ready' signal from the GC(-MS) system.

4. System options

4.1 Accessory and upgrade options:

- Internal standard option (U-ISDP-TT247-XR) for introduction of gas-phase standard onto either cold trap, providing improved precision of quantitative analysis.
- Kori-xr module(s) (U-KORI-TT247-XR) (recommended): Uses an electrically cooled trap to remove water from humid air streams prior to analyte focusing, allowing analysis of polar and non-polar species, oxygenates, and pinenes.
- In-line dryer(s) (U-ASDRY-TT): Nafion™ dryer for monitoring ultra-volatile, non-polar compounds in humid atmospheres.
- Heated sample line(s) (U-HSLTT): Extends the sample inlet by 2 m to allow remote sampling.
- Sample pump (U-ASPM1/U-ASPM2/U-ASPM3) to pull atmospheric-pressure sample gas through the traps *via* the sample inlets.
- Integrated electronic mass flow control of split flow (U-DMFC-XR): MFC available with flow range between 2–500 mL/min (helium) and 2–250 mL/min (nitrogen).

4.2 Configuration compatibility

- To each sample channel one of the following options can be added:
 - Heated sample line.
 - Heated sample line + Kori-xr.
 - Kori-xr.
 - Nafion in-line dryer.
- The internal standard accessory can be added to any of the above TT24-7xr configurations.

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